NON-PUBLIC?: N
ACCESSION #: 9012210150
LICENSEE EVENT REPORT (LER)

FACILITY NAME: McGuire Nuclear Station, Unit 1 PAGE: 1 OF 6

DOCKET NUMBER: 05000369

TITLE: Unit 1 Experienced A Turbine Trip/Reactor Trip Because Of A Temperature Instrument That Was Damaged Due To An Unknown Cause
EVENT DATE: 11/17/90 LER #: 90-032-00 REPORT DATE: 12/17/90

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Alan Sipe, Chairman, McGuire Safety Review Group TELEPHONE: (704) 875-4183

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On November 17, 1990, at 0319, Unit 1 experienced a Turbine Trip, followed by a Reactor Trip. The trip was initiated by the B Low Pressure (LP) Turbine High Exhaust Hood Temperature signal. Prior to the event, Unit 1 was operating in Mode 1 (Power Operation) at 100 percent power. Operations (OPS) Control Room personnel implemented procedure EP/1/A/5000/01, Reactor Trip or Safety Injection, and then entered procedure EP/1/A/5000/1.3, Reactor Trip. OPS personnel made the required notification to the NRC per procedure RP/0/A/5700/10, NRC Immediate Notification Requirements. The motor driven Auxiliary Feedwater pumps started as required, due to a low low Steam Generator (S/G) water level. There were no other Safety System Actuations. OPS Control Room personnel entered procedure OP/1/A/6100/05, Unit Fast Recovery. On November 17, 1990, at 1821, Unit 1 entered Mode 1. It was determined by Instrument and Electrical (IAE) personnel that the trip signal was received because

of a damaged LP Turbine Exhaust Hood Temperature instrument. To prevent recurrence of this event, Maintenance Engineering Services (MES) personnel will evaluate the use of a dual element thermocouple or possible use of a two out of two logic for the temperature signal. This event has been assigned a cause of Unknown since it cannot be determined what caused the temperature instrument to become damaged.

END OF ABSTRACT

EVALUATION:

Background

The Main Turbine EIIS:TRB! is a mechanical device used to drive the Generator EIIS: GEN!. The Turbine takes available energy from steam and converts it into mechanical energy (work). This energy is used to turn the Generator. The turbine-generator unit consists, in part, of three Low Pressure (LP) Turbine sections. Located at the ends of each section of the LP turbine are temperature instruments EIIS:TS!. The instruments monitor the exhaust hood temperature on the LP turbine. These instruments are designed to send an indication to the Control Room EIIS:NA! when the exhaust hood temperature reaches 175 degrees F (Pre-Trip Alarm EIIS:ALM! setpoint). A second indication is sent to the Control Room when the temperature reaches 250 degrees F (Trip/Alarm setpoint). This indication will cause the turbine to trip and if the operating unit is above 48 percent power, the Reactor EIIS:RCT! will also trip.

There are six temperature instruments associated with the three LP turbine sections. The instruments operate on a one out of one logic where any one temperature instrument can cause a turbine trip under the right conditions.

The temperature instrument is composed of an outer cylindrical tube EIIS:TBG! made of stainless steel. Housed within the stainless steel tube is a rod EIIS:ROD! made of a ceramic material which is temperature sensitive. The ceramic rod is attached to a shaft which is connected to a switch consisting of two sets of contacts. The expansion of the ceramic rod, as a result of increased temperature, will cause the first set of contacts to close at 175 degrees F. If the rod continues to expand, the second set of contacts will close at 250 degrees F. High exhaust hood temperature can be caused by low steam flow through the last turbine stages and high condenser EIIS:COND! back pressure. To reduce the exhaust hood temperature, exhaust hood spray nozzles EIIS:NZL! are

mounted to the inner casing end bell of the LP turbine. The nozzles direct condensate quality water into the exhaust steam which cools it down to the desired temperature. Temperature indication can be read on the plant computer EIIS: CPU! or locally.

Description of Event

On November 17, 1990, at 0319, while operating at 100 percent power, Unit 1 experienced a Turbine Trip followed by a Reactor Trip. The trip was initiated by the B LP Turbine High Exhaust Hood Temperature signal. Prior to the trip, the unit was operating at steady state, Power Operation (mode 1). After the trip, Operations (OPS) Control Room personnel initiated the Turbine Exhaust Hood Spray. A Nuclear Equipment Operator (NEO) was dispatched to the Turbine deck to check the local temperature gauges. Once the NEO confirmed the turbine exhaust hood temperature was below 175 degrees F, OPS Control Room personnel secured the Exhaust Hood Spray. OPS Control Room personnel implemented procedure EP/1/A/5000/01, Reactor Trip Or Safety Injection, and then entered procedure EP/1/A/5000/1.3, Reactor Trip, The NRC was notified,

as required at 0352, per procedure RP/0/A/5700/10, NRC Immediate Notification Requirements. Work Request (WR) 143610 was generated at 0405, by OPS personnel, to investigate and repair the reason the B LP Turbine Exhaust Hood Temperature signal was received. Upon investigation, Instrument and Electrical (IAE) personnel discovered the Turbine Exhaust Hood Temperature instrument had been damaged. IAE personnel replaced the temperature instrument and inspected the remaining five temperature instruments. The remaining five temperature instruments were verified to be undamaged.

As a result of the unit trip, the signal was received to auto start the motor driven Auxiliary Feedwater (CA) EIIS:BA! pumps EIIS:P!. This signal was received because of low low water level on Steam Generator (S/G) EIIS:SG! D. There were no other Safety System Actuations. All systems responded as expected and there were no abnormal or unexplained occurrences. At 0539, OPS Control Room personnel entered procedure OP/1/A/6100/05, Unit Fast Recovery.

On November 17, 1990, at 1821, Unit 1 entered Mode 1.

Conclusion

This event has been assigned a cause of Unknown since it cannot be determined what caused the exhaust hood temperature instrument to become

damaged. Observation of the damaged temperature instrument by IAE personnel, revealed an approximate 1/4 inch perforation in the stainless steel tubing which houses a ceramic rod. The force that caused the perforation was strong enough to also break and shatter the ceramic rod. IAE personnel believ
that some loose material penetrated the surface of
the stainless steel tube, shattering the ceramic rod; however, it is not known what the material was or where it came from. It appears that it was an instantaneous event since OPS Control Room personnel did not receive a pre-trip alarm. This alarm alerts OPS Control Room personnel that the exhaust hood temperature has reached 175 degrees F and a possible problem exists with the turbine exhaust hood. There are actions OPS Control Room personnel can implement to alleviate the condition. However, when or if the temperature reaches 250 degrees F the signal is sent to trip the Turbine. If the operating unit is above 48 percent power, the Reactor will also trip.

Upon investigation by IAE personnel, it was observed that the switch contacts were still closed, indicating a pre trip and trip signal. The shattered pieces of the ceramic rod had caused the shaft to lodge in place, preventing the switch contacts from opening.

It is also possible the temperature instrument could have been damaged during the previous Unit 1 outage, since there was extensive maintenance performed on the Turbine; however, there is no evidence to support this hypothesis.

IAE personnel have sent the damaged stainless steel tube to the Duke Power metallurgical lab for analysis.

To prevent this event from recurring Maintenance Engineering Services (MES) personnel will evaluate the use of a dual element thermocouple EIIS:THC!, or possible use of a two out of two logic where it would take two temperature instruments to trip the unit. Currently, it only takes one out of two temperature instruments (per LP Turbine) to trip the unit.

A review of the Operating Experience Program (OEP) data base for the previous twenty four months prior to this event revealed two LERs where a Reactor Trip occurred because of an Unknown. LER 369/90-01 described a Reactor Trip which occurred because of a clogged strainer on Main Feedwater Pump A speed controller EIIS: SC! caused by water in the oil system for unknown reasons. LER 370/89-01 described a Reactor Trip which occurred because of Control Rods dropping into the core due to an unknown. The corrective actions for these two LERs were specific to the

events and would not have prevented this event from occurring. Although all three LERs involved Reactor Trips for unknown reasons, there were no other similarities. This is, therefore, considered to be a nonrecurring problem.

This event is not Nuclear Plant Reliability Data System reportable.

There were no personnel injuries, radiation overexposures, or uncontrolled releases of radioactive material as a result of this event.

CORRECTIVE ACTIONS:

Immediate: OPS Control Room personnel initiated Turbine Exhaust Hood Spray.

Subsequent: 1. A NEO was dispatched to the Turbine deck to check local temperature gauges.

2. OPS Control Room personnel secured the Turbine Exhaust Hood Spray once the temperature was verified to be below 175 degrees F.

3. IAE personnel replaced the damaged temperature instrument.

Planned: MES personnel will evaluate the use of a dual element thermocouple or possible use of a two out of two logic for the temperature alarm signal.

SAFETY ANALYSIS:

The Turbine/Reactor Trip occurred because of a LP Turbine High Exhaust Hood Temperature signal which was initiated by a damaged temperature instrument. Even though the ceramic rod was broken and shattered, it is arranged in the stainless steel tube such that when it expands, as a result of increased temperature, it expands in one direction. This expansion will cause a pre-trip and trip signal. When the ceramic rod was broken, it traveled in

the conservative direction. The Reactor Trip initiated by the Turbine Trip is bounded by the Turbine Trip events of the McGuire Final Safety Analysis Report Accident Analysis, Chapter 15.

Once the trip signal was initiated, all plant Safety Systems responded as

required. To maintain a heat sink, the motor driven CA pumps started in response to low low S/G water level. Lifting of the Pressurizer (PZR) EIIS:PZR! Code Safety Valves, PZR Power Operated Relief Valves EIIS:RV! (PORVs), S/G PORVs, and Main Steam Line Code Safety Valves was not required. The Steam Dump valves to the Condenser opened as required.

All Primary and Secondary system parameters necessary to achieve a Safe Shutdown were at or approaching no-load conditions approximately 30 minutes after the Reactor Trip. Emergency Core Cooling and Emergency Power were not required and were not actuated. The event presented no hazard to the integrity of the plant.

There were no radiological consequences as a result of this trip. The health and safety of the public were not affected as a result of this event.

ADDITIONAL INFORMATION:

Sequence of Events:

PTR - Post Trip Review Report
PR - Personnel Recollection
SSL - Unit 1 Shift Supervisor Logbook
OAC - Operator Aid Computer
WR - Work Request

Date Time Event

11/17/90 0319:34 A Turbine/Reactor Trip occurred due to the failure of a Turbine Exhaust Hood Temperature instrument. (PTR,OAC)

---- OPS Control Room personnel initiated the Turbine Exhaust Hood Spray. (PR)

0320:02 The motor driven CA pumps started because of low low S/G D water level. (OAC,PTR)

---- A NEO was dispatched to the Turbine deck to check the local temperature gauges. (PR)

---- OPS Control Room personnel implemented the Reactor Trip Or Safety Injection procedure, then entered the Reactor Trip procedure. (SSL)

---- OPS Control Room personnel secured the Turbine Exhaust Hood Spray. (PR)

0352 OPS personnel made the required notification to the NRC. (SSL)

0405 OPS personnel wrote a WR to investigate and repair the problem with B LP turbine exhaust hood temperature instrument. (PR)

0419 The motor driven CA pumps were stopped by OPS Control Room personnel. (PTR)

0539 OPS Control Room personnel entered the Unit Fast Recovery procedure. (SSL)

---- IAE personnel replaced the damaged temperature switch. (PR,WR)

1821 OPS Control Room personnel returned Unit 1 to Mode 1. (SSL)

Duke Power Company
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DUKE POWER

December 17, 1990

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Subject: McGuire Nuclear Station Unit 1
Docket No. 50-369
Licensee Event Report 369/90-32

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee

Event Report 369/90-32 concerning a Turbine Trip-Reactor Trip because of a damaged temperature instrument. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

T. L. McConnell

DVE/ADJ/cbl

Attachment

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